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Organism's responses to a long-term inhalation of silica-containing submicron particles (predominantly, nanoscale) of an industrial aerosol

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Outbred female white rats were exposed for 3 or 6 months, 5 times a week, 4 h a day to an aerosol containing 72% amorphous silica predominantly submicron particles (nanoscale ones included) at an exposure concentration of 2.6 ± 0.6 or 10.6 ± 2.1 mg/m^3.

The silica (mostly amorphous) containing submicron particles with a prevailing proportion of those in the nanoscale range induce, when instilled intratracheally, a pulmonary cell response comparable with that to highly cytotoxic and fibrogenic standard quartz powder DQ12. Nevertheless, in long-term inhalation experiment at realistic concentrations, they proved to be of very low systemic toxicity and negligible pulmonary fibrogenicity.

This paradox may be explained by low SiO_2 retention in lungs and other organs due to a relatively high solubility of these nanoparticles in relevant biological and model milieus.